**Amendments to the Claims**

1. (Currently amended) A method of producing a powder, comprising:

combining at least one salt of aluminum with at least one salt of yttrium;

dissolving said at least one salt of aluminum and said at least one salt of yttrium in water to form an aqueous mixture, wherein aluminum and yttrium are present at a mole ratio of 3:5 yttrium to aluminum in said mixture;

adding at least one reducing agent and at least one auxiliary oxidizing agent to said mixture;

heating said mixture to a first temperature after adding said at least one reducing agent and said at least one auxiliary oxidizing agent such that said mixture undergoes combustion and a powder is formed; and

calcining said powder at temperatures between greater than 700 °C to about 1000 °C for an amount of time sufficient to form single phase cubic yttrium aluminum garnet.

2. (Original) The method as claimed in claim 1 wherein said at least one salt of aluminum comprises an aluminum nitrate.

3. (Original) The method as claimed in claim 1 wherein said at least one salt of aluminum comprises an aluminum perchlorate.

4. (Original) The method as claimed in claim 1 wherein said at least one salt of aluminum comprises an aluminum sulfate.

5. (Original) The method as claimed in claim 1 wherein said at least one salt of yttrium comprises a yttrium nitrate.

6. (Original) The method as claimed in claim 1 wherein said at least one salt of yttrium comprises a yttrium sulfate.

7. (Original) The method as claimed in claim 1 wherein said at least one salt of yttrium comprises a yttrium perchlorate.

8. (Original) The method as claimed in claim 1 wherein said at least one salt of aluminum comprises an aluminum nitrate, and wherein said at least one salt of yttrium comprises a yttrium nitrate.

9. (Original) The method as claimed in claim 8 wherein said aluminum nitrate comprises $Al(NO_3)_3 \cdot 9H_20$, and wherein said yttrium nitrate comprises $Y(NO_3) \cdot 6H_20$.

10. (Original) The method as claimed in claim 1 further comprising combining at least one salt of a rare earth element with said salt of aluminum and said salt of yttrium, wherein:

said rare earth element, said aluminum, and said yttrium are present at a mole ratio of 3:5 rare earth plus yttrium to aluminum; and

said powder comprises a singe phase cubic doped yttrium aluminum garnet after said calcining.

11. (Previously presented) The method as claimed in claim 10 wherein said rare earth element is selected from Nd, Yb, Sc, Pr, Eu, and Er and combinations thereof.

12. (Previously presented) The method as claimed in claim 1 wherein said at least one reducing agent comprises alanine.

13. (Original) The method as claimed in claim 12 wherein said alanine comprises β-alanine and DL-alanine.

14. (Original) The method as claimed in claim 1 wherein said at least on auxiliary oxidizing agent comprises ammonium nitrate.

15. (Original) The method as claimed in claim 1 wherein the total moles of said at least one reducing agent and said at least one auxiliary oxidizing agent is equal to between about 1.4 to about 1.5 times the total moles of said aluminum salt plus said yttrium salt.

16. (Original) The method as claimed in claim 1 wherein said mixture is heated after adding said at least one reducing agent and said at least one auxiliary oxidizing agent to remove the water prior to said combustion of said mixture.

17. (Previously presented) The method as claimed in claim 1 wherein said first temperature is between about 220 °C to about 250 °C.

18. (Original) The method as claimed in claim 1 wherein said powder is de-agglomerated prior to said calcining.

19. (Original) The method as claimed in claim 1 wherein said powder comprising said single phase cubic yttrium aluminum garnet has a primary particle size between about 30 nm to about 60 nm.

20. (Original) The method as claimed in claim 18 wherein said powder has a primary particle size of about 50 nm.

21. (Canceled)

22. (Currently amended) A method of producing a powder, comprising:

combining at least one oxide of aluminum with at least one salt of yttrium;

dissolving said at least one salt of aluminum and said at least one salt of yttrium in water to form an aqueous mixture, wherein said aluminum and said yttrium are present at a mole ratio of 3:5 aluminum to yttrium in said mixture;

adding at least one reducing agent to said mixture;

heating said mixture to a first temperature after adding said at least one reducing agent such that said mixture undergoes partial combustion and a powder is formed;

calcining said powder at a first temperature range; and

calcining said powder at a second temperature range until at least some of said powder comprises a yttrium aluminum perovskite phase, wherein said first temperature range is lower

than said second temperature range, and wherein said second temperature range comprises between about 700 °C to about 1000 °C.

23. (Previously presented) The method as claimed in claim 22 wherein said oxide of aluminum is selected from the group consisting of $\alpha$-$Al_2O_3$, $\gamma$-$Al_2O_3$, and combinations thereof.

24. (Original) The method as claimed in claim 22 wherein said salt of yttrium comprises a yttrium nitrate.

25. (Original) The method as claimed in claim 22 wherein said salt of yttrium comprises a yttrium sulfate.

26. (Original) The method as claimed in claim 22 wherein said salt of yttrium comprises a yttrium perchlorate.

27. (Previously presented) The method as claimed in claim 22 further comprising combining at least one salt of a rare earth element with said oxide of aluminum and said salt of yttrium, wherein:

said rare earth element, said aluminum, and said yttrium are present at a mole ratio of 3:5 rare earth plus yttrium to aluminum; and

at least some of said powder comprises a doped yttrium aluminum perovskite phase after said calcining at said second temperature.

28. (Original) The method as claimed in claim 27 wherein said rare earth element is selected from Nd, Yb, Sc, Pr, Eu, and Er and combinations thereof.

29. (Original) The method as claimed in claim 22 wherein said at least one reducing agent is selected from $\beta$-alanine, DL-alanine, and combinations thereof.

30. (Original) The method as claimed in claim 22 wherein said at least one reducing agent comprises between about a 1 to about a 0.9 : 1 mole ratio with said salt of yttrium.

31. (Original) The method as claimed in claim 22 wherein said mixture is heated after adding said at least one reducing agent to remove the water prior said partial combustion.

32. (Previously presented) The method as claimed in claim 22 wherein said first temperature is between about 200 °C to about 220 °C.

33. (Original) The method as claimed in claim 22 wherein said powder is dispersed in ethyl alcohol prior to said calcining at said first temperature range.

34. (Previously presented) The method as claimed in claim 22 wherein said first temperature range is about 600 °C.

35. (Previously presented) The method as claimed in claim 22 wherein said second temperature range is between about 700 °C to about 1000 °C.

36. (Original) The method as claimed in claim 22 wherein said powder is de-agglomerated by milling prior to calcining at said second temperature range.

37. (Original) The method as claimed in claim 22 wherein said powder comprises yttrium aluminum perovskite, $\alpha$-$Al_2O_3$ or $\gamma$-$Al_2O_3$, and $Y_2O_3$ phases after said calcining at said second temperature range.

38. (Previously presented) The method as claimed in claim 37 wherein said powder comprising yttrium aluminum perovskite has a primary particle size between about 30 nm to about 60 nm.

39. (Canceled)

40. (Currently amended) A method of producing polycrystalline yttrium aluminum garnet, comprising:

providing a compact comprising at least one powder selected from undoped yttrium aluminum garnet, doped yttrium aluminum garnet, ~~a powder mixture having~~ undoped yttrium aluminum perovskite, and ~~a powder mixture having~~ doped yttrium aluminum perovskite;

sintering said compact in flowing oxygen at temperatures of between about 1600 °C to about 1650 °C for a holding period of between about 5 hours to about 10 hours such that sintered yttrium aluminum garnet is formed; and

hot isostatically pressing said sintered yttrium aluminum garnet at temperatures of between about 1500 °C to about 1550 °C and at a pressure between about 25 kpsi to about 30 kpsi such that a transparent polycrystalline yttrium aluminum garnet is formed having a mean grain size between about 1 μm to about 3 μm.

41. (Canceled)

42. (Original) The method as claimed in claim 40 wherein said compact is sintered such that said compact is heated and cooled at a rate of about 5 °C/minute to about 10 °C/minute.

43. (Original) The method as claimed in claim 40 wherein said compact has a density of between about 95.0% to about 99.5% of the theoretical density of said compact after said sintering.

44. (Original) The method as claimed in claim 40 wherein said compact is hot isostatically pressed for between about 5 hours to about 10 hours.

45. (Original) The method as claimed in claim 40 wherein said compact is hot isostatically pressed at a pressure of about 30 kpsi.

46. (Original) The method as claimed in claim 40 wherein said compact is hot isostatically pressed using high purity argon.

47. (Original) The method as claimed in claim 40 wherein the surface of said compact is polished using a diamond slurry after said compact is hot isostatically pressed.

48. (Canceled)

49. (New) A method of producing polycrystalline yttrium aluminum garnet comprising:

combining at least one salt of aluminum with at least one salt of yttrium;

dissolving said at least one salt of aluminum with said at least one salt of yttrium to form an aqueous mixture, wherein aluminum and yttrium are present at a mole ratio of 3:5 yttrium to aluminum in said mixture;

adding at least one reducing agent and at least one auxiliary oxidizing agent to said mixture;

heating said mixture to a first temperature after adding said at least one reducing agent and said at least one auxiliary oxidizing agent such that said mixture undergoes combustion and a powder is formed;

calcining said powder at temperatures between greater than 700 °C to about 1000 °C for an amount of time sufficient to form single phase cubic yttrium aluminum garnet;

forming a compact from said single phase cubic yttrium aluminum garnet powder;

sintering said compact in flowing oxygen at temperatures of between about 1600 °C to about 1650 °C such that sintered yttrium aluminum garnet is formed; and

hot isostatically pressing said sintered yttrium aluminum garnet at temperatures of between about 1500 °C to about 1550 °C and at a pressure between about 25 kpsi to about 30 kpsi such that a transparent polycrystalline yttrium aluminum garnet is formed having a mean grain size between about 1 μm to about 3 μm.

50. (New) A method of producing polycrystalline yttrium aluminum garnet comprising:

combining at least one oxide of aluminum with at least one salt of yttrium;

dissolving said at least one salt of aluminum with said at least one salt of yttrium to form an aqueous mixture, wherein said aluminum and said yttrium are present at a mole ratio of 3:5 aluminum to yttrium in said mixture;

adding at least one reducing agent to said mixture;

heating said mixture to a first temperature after adding said at least one reducing agent such that said mixture undergoes partial combustion and a powder is formed;

calcining said powder at a first temperature range;

calcining said powder at a second temperature range until at least some of said powder comprises a yttrium aluminum perovskite phase, wherein said first temperature range is lower than said second temperature range, and wherein said second temperature range comprises between about 700 °C to about 1000 °C;

forming a compact from said powder comprising at least a yttrium aluminum perovskite phase;

sintering said compact in flowing oxygen at temperatures of between about 1600 °C to about 1650 °C such that sintered yttrium aluminum garnet is formed; and

hot isostatically pressing said sintered yttrium aluminum garnet at temperatures of between about 1500 °C to about 1550 °C and at a pressure between about 25 kpsi to about 30 kpsi such that a transparent polycrystalline yttrium aluminum garnet is formed having a mean grain size between about 1 μm to about 3 μm.